

**STRUCTURES FOR PROVIDING A REMOVABLE CLOSURE**

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**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application claims the benefit of U.S. Provisional Application Nos. 60/248,026 and 60/248,340, each filed November 13, 2000, and each application entirely incorporated herein by reference.

**FIELD OF THE INVENTION**

The present invention relates to providing closure for a container, and more particularly, structures for providing a removable closure.

**BACKGROUND OF THE INVENTION**

Preshaped snack pieces are typically frangible and might be fragile and easily broken during packaging, shipping and/or other handling operations. Conventional packaging techniques provide bags and/or boxes that can permit a significant number of the snack pieces to break or crush prior to consumption. The well known Pringles® shaped potato chip snack pieces, a product of The Procter & Gamble Company, Cincinnati, Ohio, are individual snack pieces having a "saddle" shape and are packaged in a manner which overcomes disadvantages of the prior art. The Pringles® snack pieces have conventionally been packaged as a single nested stack in a cylindrical container which provides enhanced protection during packaging, shipping and/or other handling. As a result, the Pringles® snack pieces are typically presented to the consumer without breakage.

There is a continuing need for user-friendly, relatively inexpensive containers for packaging frangible snack pieces to provide protection during packaging, shipping and/or other handling. It is further desired to provide hermetically sealed containers that provide oxygen and moisture protection to prevent spoilage of the snack pieces contained therein.

It might also be desirable to provide such inexpensive containers for other types of frangible and/or fragile articles to reduce breakage of the articles during packaging, shipping

and/or other handling, to maintain desirable properties of the articles, and to provide a user-friendly package.

### SUMMARY OF THE INVENTION

Accordingly, the present invention provides various structures for providing a removable closure for a container.

In one embodiment, a membrane lid is provided. The membrane lid includes a surface with a substantially triangular-shaped perimeter. The perimeter includes first, second and third corner portions, wherein each corner portion is bisected by an imaginary line. The membrane lid further includes a projection with a tab and adapted to initially direct a lifting force to at least one of the corner portions. The projection either extends outwardly from the perimeter such that the projection is non-symmetrically disposed with respect to the imaginary line of any adjacent corner portion, or the projection extends non-continuously from an adjacent corner portion and is substantially symmetrically disposed with respect to the imaginary line of the adjacent corner portion.

In another embodiment, a container is provided with a lip having a substantially triangular-shaped horizontal cross-section. The lip includes three corner portions and three sides, wherein the sides of the lip are structured differently than the corner portions of the lip to increase the relative rigidity of the sides with respect to the corner portions such that the corner portions and the sides are adapted to exhibit a substantially uniform reaction pressure when applying a membrane lid to the lip of the container.

The membrane lids, container lips and containers according to the present invention are advantageous for packaging articles, such as substantially triangular-shaped articles to prevent breakage of the articles. In one example, the structures provided herein are useful for packaging tortilla chips and the like to conveniently provide consumers with a product having minimum breakage prior to consumption while providing an extended shelf life.

The membrane lids according to the invention allow application of an over-cap with high reliability and minimal interference with the membrane lid. The membrane lids of the invention may be conveniently removed when desired yet avoid inadvertent removal during packaging, shipping or other handling. The container lips according to the invention further allow the formation of a reliable and durable hermetic seal with the membrane lid and contribute to over-cap retention, even when containers employing the lip are subjected to pressure differentials, for example at high altitudes.

Additional objects and advantages of the invention will be more fully apparent in view of the following detailed description.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

5 The following detailed description will be more fully understood in view of the drawings in which:

FIG. 1 is a top plan view of one embodiment of a membrane lid according to the invention;

FIG. 2A is a top plan view of a second embodiment of a membrane lid according to the invention;

10 FIG. 2B is a partial plan view of a third embodiment of a membrane lid according to the invention;

FIG. 2C is a partial plan view of a fourth embodiment of a membrane lid according to the invention;

15 FIG. 2D is a partial plan view of a fifth embodiment of a membrane lid according to the invention;

FIG. 2E is a partial plan view of a sixth embodiment of a membrane lid according to the invention;

FIG. 2F is a partial plan view of a seventh embodiment of a membrane lid according to the invention;

20 FIG. 2G is a partial plan view of an eighth embodiment of a membrane lid according to the invention;

FIG. 2H is a partial plan view of a ninth embodiment of a membrane lid according to the invention;

25 FIG. 3 is a cross-section of a stack of membrane lids wherein each membrane lid includes at least one bevel portion to assist in alignment;

FIG. 4 is an elevational view of an exemplary container according to the present invention;

FIG. 5 is a top plan view of the container of FIG. 4;

FIG. 5A is a partial sectional view along line 5A-5A of FIG. 5;

30 FIG. 5B is a partial sectional view depicting a second embodiment of a lip structure;

FIG. 5C is a partial sectional view illustrating a third embodiment of a lip structure;

FIG. 6 is an enlarged view of Detail 6 in FIG. 4;

FIG. 7 is an enlarged view Detail 7 in FIG. 4;



FIG. 7A is an enlarged view of the second embodiment of the lip structure;

FIG. 7B is an enlarged view of the third embodiment of the lip structure;

FIG. 8 is a top plan view of an exemplary over-cap for use with containers according to the present invention; and

5 FIG. 9 is a side elevational view of the over-cap set forth in FIG. 8.

#### **DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS**

The invention is directed to structures for providing a removable closure to permit packaging of one or more pieces (i.e., one or more articles) such as substantially triangular-shaped pieces. In one application, one or more snack pieces may be packaged, and in particular

10 embodiments, one or more substantially triangular-shaped snack pieces may be packaged to present consumers with an accessible product with minimal breakage. It is contemplated that a wide variety of snack pieces may be packaged with the structures in accordance with the present invention. For example, snack pieces having a substantially triangular, substantially circular, substantially elliptical, substantially rectangular, substantially square or other shaped snack pieces

15 such as chips (e.g., tortilla chips, potato chips, vegetable chips, fruit chips, bagel chips), crackers, biscuits, cookies, candy, or the like. Each of the above mentioned snack piece shapes could be packaged, for example, with a variety of containers having various alternative shapes such as containers having a substantially circular, substantially elliptical, substantially rectangular, substantially square, substantially triangular, or other shape. Exemplary containers that can be

20 used with the inventive concepts of the present invention are disclosed in copending U.S. Provisional Application No. 60/248,340 of Buisson et al. filed November 13, 2000 entitled "An Improved Plastic Package for Snack Pieces." Additional containers and structures relating thereto that may also be used with the present invention are disclosed in U.S. Provisional Application No. 60/248,103 of Buisson et al. filed November 13, 2000 and U.S. Patent Application No. \_\_\_\_

25 \_\_\_\_\_, titled "Container Bottom and Methods" attorney docket No. 8331M filed herewith, the entire disclosures of which are incorporated herein by reference. While exemplary structures of the present invention are described for use with edible snack pieces, the structures presented herein may be useful to store, package and/or ship other piece(s), including, but not limited to, a plurality of frangible or fragile pieces (i.e., a plurality of frangible or fragile articles) in a stacked

30 relationship.

Structures for providing closure may comprise membrane lids, container lips and/or containers which are particularly suitable for packaging articles, such as substantially triangular-shaped articles. The membrane lids, container lips and containers according to the present

invention provide improvements which facilitate packaging, contribute to reduced breakage during packaging, shipping and/or handling, and/or contribute to maintaining the hermetic seal of the container while presenting a user-friendly membrane lid to a consumer for removal at will. In particular embodiments of the present invention, exemplary membrane lids, container lips and  
5 containers are substantially triangular-shaped and may be used, for example, to package substantially triangular-shaped articles. Within the context of the present invention, "substantially triangular-shaped" includes a generally three-side polygon shape wherein the sides are connected with one another at respective corner portions and can comprise a sharp angle or a more rounded configuration. In the exemplary membrane lids (e.g., see FIG. 1), the rounded corner portions  
10 connect straight or substantially straight sides. Within the present invention, "straight" may include a distance between the corner portions, rather than requiring any surface or cross-sectional configuration of the sides.

One aspect of the present invention includes membrane lid structures for providing closure to a container. For example, the membrane lid may have a substantially triangular shape  
15 to connect with a substantially triangular-shaped opening of a container.

In exemplary embodiments, the substantially triangular-shaped membrane can have three sides and three corner portions that are each bisected by an imaginary line. Exemplary membrane lids include one or more projections that extend outwardly from a substantially triangular-shaped perimeter without intersecting the imaginary line of any adjacent corner portion. Embodiments of  
20 membrane lids also include one or more projections that are non-symmetrically disposed with respect to the imaginary line of any adjacent corner portion or one or more projections that extends non-continuously from an adjacent corner portion and are substantially symmetrically disposed with respect to the imaginary line of the adjacent corner portion. For example, the membrane lids can include one or more projections that are interrupted along the imaginary line  
25 of an adjacent corner portion. Each of the exemplary projections in accordance with the present invention are structured to direct a lifting force to at least one corner portion regardless of the location along the perimeter of the membrane.

Providing one or more projections with one or more of the above-mentioned structures may reduce or prevent interference of the membrane lid projection(s) with the container lip and/or  
30 inner extensions of the over-cap corner portions. After a membrane lid is sealed to a container, an over-cap is typically applied over the membrane lid for protecting the membrane lid and/or to permit selective closure of the container once the membrane lid is at least partially removed. Exemplary over-caps that may be used with the inventive concepts of the present invention are

disclosed in U.S. Provisional Application No. 60/248,089, filed November 13, 2000, and also U.S. Patent Application No. \_\_\_\_\_, titled "Substantially Triangular-Shaped Over-Cap" attorney docket No. 8329M filed herewith, the entire disclosures of which are incorporated herein by reference.

5 Any interference between the membrane lid projection and the over-cap tends to reduce the reliability of the connection between the over-cap and the membrane sealed container. For example, interference between the membrane lid projection and over-cap may present a significant obstacle when applying the over-cap to the container on a high-speed assembly line. Moreover, after application of the over-cap, any interference between the projection and over-cap  
10 may cause inadvertent disengagement of the over-cap from the container. For instance, the above-mentioned interference can present a problem with changes in atmospheric or external air pressure resulting in changes in the interior chamber pressure of the container. If the outside air pressure decreases (e.g., that might develop in high altitude locations), the over-cap may disconnect as the container expands in response to increased interior chamber pressure.

15 Referring now to the drawing figures in detail, wherein like numerals indicate the same elements throughout the views, FIG. 1 depicts one exemplary embodiment of a membrane lid 10 comprising a generally planar surface 12 having a substantially triangular-shaped perimeter 14. The perimeter of the membrane includes three sides 16 wherein at least one of the sides (e.g., "16a") can be represented by a hidden line. The hidden lines illustrated throughout the figures  
20 demonstrate the substantially triangular shape of the perimeter adjacent the one or more projections and is not intended to denote perforations or any other type of alteration to the generally planar surface 12. In one embodiment, the membrane lid 10 has a substantially equilateral triangular-shaped perimeter, wherein the sides 16 of the triangular shape are of equal or substantially equal length.

25 The membrane lid 10 also includes corner portions 20a, 20b, 20c which are shown as rounded but may be more or less angled as desired and each include an imaginary center line 18a, 18b, 18c that bisects each corresponding corner portions 20a, 20b, 20c. The membrane lid 10 is sized and dimensioned to cover a similarly substantially triangular-shaped container, such as a perimeter of a container opening. In one exemplary embodiment, the membrane lid 10 may be  
30 used to connect to a container lip 54 located adjacent one end of a container body 52 (see FIG. 4 and FIG. 5). The lengths of the sides 16 of the membrane lid 10 will be designed to cover the perimeter of the opening and may be sealed to the container lip, if provided. In exemplary embodiments, as shown in FIG. 1, the membrane lid has side lengths "L" that can be from about 4

cm to about 14 cm, for example from about 6 cm to about 9 cm. In particular exemplary embodiments, the side length "L" is from about 7.5 cm to about 8.5 cm. The above lengths, however, are for exemplary purposes only; therefore, the sides may be provided with other lengths depending on the particular application.

5 As indicated in FIG. 1, the membrane lid 10 can include a projection 24 extending outwardly from the perimeter 14 of the membrane lid 10 without intersecting the imaginary line 18a, 18b of any adjacent corner portion 20a, 20b. Although not shown, the membrane lid could be provided with a plurality of projections, for example, comprising any combination of the exemplary projections described throughout this application or their equivalents. When the  
10 perimeter of the membrane lid is adhered to a surface, each of the membrane lid projections described herein is dimensioned and located to initially direct a lifting force toward at least one of the corner portions.

As illustrated in FIG. 1, for example, the projection 24 extends generally outwardly from at least one side 16a of the perimeter 14 such that the projection 24 is non-symmetrically disposed  
15 with respect to the imaginary lines 18a, 18b of adjacent corner portions 20a, 20b. The projection may also include two tabs 26a and 26b that can be arranged to symmetrically disposed along the perimeter with respect to the imaginary line 18c of a distal corner portion 20c. Providing dual tabs permit easy access from a left-handed or right-handed individual and may assist in removing residual portions of a ripped membrane lid that might remain after a first attempt to remove the  
20 lid. Alternatively or in addition, the one or more projections described above can include one or more tabs to extend from two or more sides of the substantially triangular-shaped membrane lid, thereby facilitating tab access at different positions of the container relative to the consumer. Moreover, although not shown, the projections described herein may comprise three or more tabs extending from the perimeter in accordance with the present invention. Each tab 26a, 26b can be  
25 gripped by a consumer at lifting point 28a or 28b to apply a lifting force to the projection 24 to facilitate removal of the membrane lid 10 from the container lip or other surface to which the membrane lid is adhered.

The projections of the present invention are structured to discourage tearing of the membrane when a consumer applies a lifting force to at least one tab to remove the membrane lid  
30 from the attached surface (e.g., a lip of a container). In one embodiment, proper distribution of the lifting force can be accomplished by a projection which substantially covers a lifting area defined by two imaginary lines that extend from an outer tangential point at each of the two adjacent corner portions to a lifting point which is used to grip the membrane lid for application of

the lifting force. The lifting point should be position a sufficient distance from the perimeter of the membrane lid such that a consumer may sufficiently grip the projection to remove the membrane lid from the container. For example, in exemplary embodiments, the lifting point is located at least about 4 mm from the perimeter of the membrane lid. In other embodiments, the lifting point is located at least about 8 mm from the perimeter of the membrane lid. Other lifting point distances could also be used in accordance with the present invention without departing from the scope of the claims.

As depicted in FIG. 1, for example, a first lifting area 34a is at least partially or entirely defined by the perimeter 14 and a first outer imaginary line 30a extending from the first lifting point 28a to an outer tangential point of the first corner portion 20a and a first inner imaginary line 32a extending from the first lifting point 28a to an outer tangential point of the second corner portion 20b. A second lifting area 34b is at least partially or entirely defined by the perimeter 14 and a second outer imaginary line 30b extending from the second lifting point 28b to an outer tangential point of the second corner portion 20b and a second inner imaginary line 32b extending from the second lifting point 28b to an outer tangential point of the first corner portion 20a. Thus, with reference to FIG. 1, tab 26a of the projection 24 substantially or entirely covers at least the lifting area 34a at least partially or entirely defined by the perimeter 14 and lines 30a and 32a while tab 26b of the projection 24 substantially or entirely covers at least a lifting area 34b at least partially or entirely defined by the perimeter 14 and lines 30b and 32b. The projection 24 is therefore dimensioned to substantially or entirely cover each of the lifting areas 34a, 34b to distribute force over the lifting areas while initially directing the lifting force to at least one of the adjacent corner portions 20a, 20b, thereby reducing the probability of stress tears by minimizing stress concentrations.

The projection 24 may also be structured such that the lifting areas 34a, 34b define an overlap area 36 to provide additional support to further discourage tearing of the membrane, for example, when the entire lifting force is applied to a single tab (e.g., either 26a or 26b). This arrangement removes acute forces in the membrane from a point close to the middle of the corresponding side and therefore reduces the probability of undesired tearing of the membrane.

FIG. 2A discloses portions of an alternative membrane lid 110 with a surface 112 and a substantially triangular-shaped perimeter 114. The perimeter 114 includes sides 116 wherein at least one side (e.g., "116a") can be represented by a hidden line. The membrane lid 110 further includes corner portions 120a, 120b, 120c that are bisected by imaginary lines 118a, 118b, 118c. The exemplary membrane lid 110 includes a projection 124 including a single tab 126. The



projection 124 is non-symmetrically disposed with respect to the imaginary lines 118a, 118b of adjacent corner portions 120a, 120b. As described above, embodiments of the present invention including a single or multiple tabs extending outwardly from a side (e.g., from side "116a") may be symmetrically disposed along the perimeter with respect to the imaginary line 118c of a distal corner portion 120c. Optional dual tabs can be provided to distribute a lifting force and/or to permit easy access from a left-handed or right-handed individual.

5 Tabs in accordance with each of the exemplary embodiments of the present invention described throughout this application may be located closer to one corner portion or the other such that the tabs are not symmetrically disposed along the perimeter with respect to any imaginary line.

10 As illustrated in FIG. 2A, the projection 124 includes a single tab 126 which is sized to accommodate gripping by a consumer to apply a lifting force to the projection 124 at a lifting point 128 to remove the membrane lid 110 from the container lip or other surface to which it is adhered. The membrane lid 110 is sized and structured to discourage tearing of the membrane when a consumer is lifting the tab 126 to remove the membrane lid 110 from the container or other surface to which the membrane lid 110 is attached. Redirection of the lifting force to reduce tearing incidents can be accomplished by structuring the projection 124 to substantially or entirely cover a lifting area 134. The lifting area 134 is at least partially or entirely defined by the perimeter 114 and a first imaginary line 130 extending from the lifting point 128 to an outer tangential point of the first corner portion 120a and a second imaginary line 132 extending from the lifting point 128 to an outer tangential point of the second corner portion 120b. The projection 124 is therefore dimensioned to at least substantially or entirely cover the lifting area 134 to distribute force over the lifting area while initially directing the lifting force to at least one of the corresponding corner portions 120a, 120b.

25 As further shown in FIG. 2A, the outer perimeter 127 of the tab 126 may be curved inwardly such that the tab 126 includes less material. Reducing the amount of material may be desirable to reduce material costs while also preventing the tab from obscuring an advertising or other informational display disposed on the exterior surface of the container to which the membrane lid may be attached. However, the outer perimeter 127 should have a sufficient size to permit the tab 126 to at least substantially or entirely cover the lifting area 134 at least substantially or entirely defined by the perimeter 114 and lines 130, 132.

30 FIG. 2B includes a membrane lid 210 similar to the membrane lid 110 described above. In fact, unless otherwise noted, the membrane lid 210 can be identical to the membrane lid 110.

However, unlike the membrane lid 110, the membrane lid 210 includes a projection 224 having an outer perimeter 227 that does not have a reduced portion and does not curve inwardly. In fact, as shown in FIG. 2B, the outer perimeter 227 has straight line portions and, although not shown, may even curve outwardly. Structuring with outer perimeter such that the projection does not have a reduced portion (e.g., with straight line segments as illustrated) or includes augmented portions (e.g., with outwardly curved portions) will increase the structural strength of the projections 224, thereby reducing stress concentrations and corresponding tearing incidents.

FIGS. 2C-2H illustrate alternative embodiments of a projection that extends non-continuously from an adjacent corner portion and is substantially symmetrically disposed with respect to the imaginary line bisecting the adjacent corner portion. A substantially symmetrical projection will include projections that are symmetrical with respect to the imaginary line when viewed without the features that provide the non-continuous extension. Non-continuous extension of the projection can result from alternate projection material configuration, construction, composition, interruption, or the like when viewing the outer surface of the projection and/or through a cross-section of the projection. For example, the non-continuous extension can result from a weakened area of the projection. The weakened area can include portions of the projection, or the entire projection, that defines apertures, perforations, slits, scores, crimps, cuts, channels, or other irregularities. For example, the weakened area could include the entire projection or a portion less than the entire projection. The weakened areas in accordance with the present invention are designed to reduce or prevent interference between the inner extension of the over-cap and the container lip and may also reduce or prevent puckering or wrinkling of the projection as it is bent down to conform to the outer surface of the container after application of the over-cap.

FIG. 2C illustrates an exemplary membrane lid 310 wherein the perimeter includes sides 316 wherein at least one of the sides (e.g., "316a") can be represented by a hidden line. At least one corner portion 320 is bisected by an imaginary line 318 wherein a projection 324 extending outwardly from the perimeter 314 adjacent corner portion 320 is substantially symmetrically disposed with respect to the imaginary line 318 bisecting an adjacent corner portion 320. The projection 324 includes a single tab 326 presenting a lifting point 328 for a consumer. The projection 324 extends non-continuously from the adjacent corner portion 320 and includes a weakened area that comprises portions of the projection that define one or more apertures 338 with a closed perimeter 340. The aperture 338 may be adapted to prevent interference between the over-cap and portions of the container opening. For example, providing an aperture 338 may

facilitate the connection between the inner extensions 78 of the over-cap 70 and the lip 54 of the container 50 by limiting or preventing the projection from interfering with the connection between the over-cap and the lip. Indeed, the aperture 338 can be located on the projection so that the inner extensions 78 at least partially extends through the aperture 338 to engage the lip 54 when the over-cap 70 is installed on the container 50.

The symmetrical location of the aperture 338 along the imaginary line 318 causes the aperture 338 to interrupt the projection 324 along the imaginary line 318. In alternative embodiments, the aperture 338 may be offset from the imaginary line 318 and/or a plurality of apertures may be provided such that the projection 324 is not interrupted along the imaginary line 318. For example, although not shown, exemplary embodiments include a plurality of apertures symmetrically offset about the imaginary line 318 without intersecting with the imaginary line 318 such that the projection 324 is not interrupted along the imaginary line 318.

As illustrated in FIG. 2C, the aperture 338 can have a half-moon or “D” shape to further prevent interference between the projection 324 and the container 50. The projection 324 may need to be reinforced or structured with increased tearing resistance to prevent failure or ripping at the relatively sharp corner portions 342 of the aperture 338.

FIG. 2D illustrates another embodiment of a membrane lid 410 similar to the membrane lid 310 described above and can be identical unless otherwise noted. For example, the membrane lid 410 also includes a substantially triangular-shaped perimeter 414 with sides 416 wherein at least one of the sides (e.g., “416a”) can be represented by a hidden line. At least one corner portion 420 is bisected by an imaginary line 418. A projection 424 extends outwardly from the perimeter 414 adjacent corner portion 420 and is substantially symmetrically disposed with respect to the imaginary line 418 bisecting the adjacent corner portion 420. The projection 424 includes at least one tab 426 and extends non-continuously from the adjacent corner portion 420 and includes a weakened area that comprises portions of the projection that define one or more apertures 438 with a closed perimeter 440. However, unlike the membrane lid 310 illustrated in FIG. 2C, the aperture 438 of the membrane lid 410 includes a perimeter 440 with rounded or smooth corner portions 442 designed to reduce stress concentrations in the membrane when applying a lifting force at lifting point 428 to thereby reduce or prevent tearing incidents.

The aperture 438 in FIG. 2D, as well as apertures in projections of any of the embodiments of the present invention, may have a substantially circular shape. The apertures, if provided in any of the projections, could also have an oblong shape or other shape to simplify the

manufacturing process and/or enhancing the functional characteristic of the aperture to prevent interference between the over-cap and the container.

As with the aperture 338, the symmetrical location of the aperture 438 along the imaginary line 418 causes the aperture 438 to interrupt the projection 424 along the imaginary line 418. In alternative embodiments, the aperture 438 may be offset from the imaginary line 418 and/or a plurality of apertures may be provided such that the projection 424 is not interrupted along the imaginary line 418. For example, although not shown, exemplary embodiments include a plurality of apertures symmetrically offset about the imaginary line 418 without intersecting with the imaginary line 418 such that the projection 424 is not interrupted along the imaginary line 418.

FIG. 2E illustrates yet another embodiment of a membrane lid 510 in accordance with the present invention. The membrane lid 510 can be identical to the membrane lid described in FIGS. 2C or 2D or other embodiments described throughout this application including a projection with an aperture, unless otherwise noted. For example, the membrane lid 510 includes a substantially triangular-shaped perimeter 514 with sides 516 wherein at least one of the sides (e.g., "516a") can be represented by a hidden line. At least one corner portion 520 is bisected by an imaginary line 518. A projection 524 extends outwardly from the perimeter 514 of an adjacent corner portion 520 and is substantially symmetrically disposed with respect to the imaginary line 518 bisecting the adjacent corner portion 520. The projection 524 includes at least one tab 526 presenting at least one lifting point 528a, 528b. The projection 524 extends non-continuously from the adjacent corner portion 520 and includes a weakened area that comprises portions of the projection that define one or more apertures 538 to facilitate connection between the over-cap and the container as described above.

As with the apertures 338 and 438 described above, the symmetrical location of the aperture 538 along the imaginary line 518 causes the aperture 538 to interrupt the projection 524 along the imaginary line 518. In alternative embodiments, the aperture 538 may be offset from the imaginary line 518 and/or a plurality of apertures may be provided such that the projection 524 is not interrupted along the imaginary line 518. For example, although not shown, exemplary embodiments include a plurality of apertures symmetrically offset about the imaginary line 518 without intersecting with the imaginary line 518 such that the projection 524 is not interrupted along the imaginary line 518.

As illustrated in FIG. 2E, the aperture 538, as well as each of the apertures described throughout this application, may include an opening 541 providing the aperture 538 with an open

perimeter 540. The open perimeter allows the membrane lid to be formed with a single perimeter comprising an outermost perimeter rather than an inner aperture perimeter distinct from an outermost perimeter. Providing a single outermost perimeter may reduce manufacturing steps and/or otherwise reduce the manufacturing costs for producing the membrane lid. The opening  
5 541 may be a narrow or wide slit or the like. In one embodiment, the opening 541 extends along the imaginary line 518 that bisects the corner portion 520 to provide symmetrical division of lifting force when simultaneously lifting the tab at lifting points 528a, 528b.

FIG. 2F illustrates another embodiment of a membrane lid 610 in accordance with the present invention. The membrane lid 610 can be identical to the membrane lid described in FIGS.  
10 2C-2E or other embodiments described throughout the present invention unless otherwise noted. For example, the membrane lid 610 includes a substantially triangular-shaped perimeter 614 with sides 616 wherein at least one of the sides (e.g., "616a") can be represented by a hidden line. At least one corner portion 620 is bisected by an imaginary line 618. A projection 624 extends outwardly from the perimeter 614 of an adjacent corner portion 620 and is substantially  
15 symmetrically disposed with respect to the imaginary line 618 bisecting the adjacent corner portion 620. The projection 624 extends non-continuously from the adjacent corner portion 620. A weakened area of the projection 624 includes a scored portion wherein the projection includes one or more slits 638. The one or more slits can be formed as cuts that extend entirely through the thickness of the projection. In other examples, the slit can be formed as cuts that extend only  
20 partially through the thickness of the projection.

The symmetrical location of the slit 638 along the imaginary line 618 causes the slit 638 to interrupt the projection 624 along the imaginary line 618. In alternative embodiments, the slit 638 may be offset from the imaginary line 618 and/or a plurality of slits may be provided such that the projection 624 is not interrupted along the imaginary line 618. For example, although not  
25 shown, exemplary embodiments include a plurality of slits symmetrically offset about the imaginary line 618 without intersecting with the imaginary line 618 such that the projection 624 is not interrupted along the imaginary line 618.

The one or more slits 638 can be shaped in a variety of patterns, such as waved, sinusoidal, arcuate or other shape. Moreover, a plurality of slits may be provided to further  
30 weaken the projection. As illustrated in FIG. 2F for example, one slit can be intersected with a plurality of cross slits. The arcuate shape of the larger slit is designed to substantially match the contact area between the inner extension of the over-cap and the lip to reduce or prevent interference therebetween. A single slit, rather than multiple slits, may be provided to weaken the

projection to reduce interference without weakening the projection to the point that it rips or tears when applying a lifting force to the projection. In alternative embodiments, a plurality of slits may be provided to further weaken the area to further minimize interference. In one example, the slit may be formed as a cross (i.e., two intersecting slits).

5           The slit 638 may be narrow (as illustrated in FIG. 2F) or wide to facilitate functionality while reducing manufacturing costs. Providing a thin cut slit, rather than a wide slit or slot, may be easier to manufacture and prevent accumulation of scrap material. However, a wider slit or slot may be provided to further reduce interference. A wide slit can take the form of a channel (i.e., wherein the slit does not extend entirely through the thickness of the membrane lid) or an  
10       open slot (i.e., wherein the slit extends entirely through the thickness of the membrane lid).

FIG. 2G illustrates another embodiment of a membrane lid 710 in accordance with the present invention. The membrane lid 710 can be identical to the membrane lid described in FIGS. 2C-2F or other embodiments described throughout the present invention unless otherwise noted. For example, the membrane lid 710 includes a substantially triangular-shaped perimeter 714 with  
15       sides 716 wherein at least one of the sides (e.g., "716a") can be represented by a hidden line. At least one corner portion 720 is bisected by an imaginary line 718. A projection 724 extends outwardly from the perimeter 714 of an adjacent corner portion 720 and is substantially symmetrically disposed with respect to the imaginary line 718 bisecting the adjacent corner portion 720. The projection 724 extends non-continuously from the adjacent corner portion 720.  
20       A weakened area of the projection 724 includes a scored portion wherein the projection includes a plurality of perforations or slits 738. The one or more perforations or slits 738 can be formed as pinpoint pricks or cuts that extend partially or entirely through the thickness of the projection.

The perforations or slits 738 can be symmetrically or non-symmetrically disposed about the imaginary line 718. In one example, one or more of the slits intersect the imaginary line to  
25       cause an interruption in the projection 724 along the imaginary line 718. In alternative embodiments, each of the perforations or cuts 738 may be offset from the imaginary line 718 such that the projection 724 is not interrupted along the imaginary line 718. For example, although not shown, exemplary embodiments include a plurality of perforations or cuts 738 symmetrically disposed about the imaginary line 718 without intersecting with the imaginary line 718 such that  
30       the projection 724 is not interrupted along the imaginary line 718.

The perforations or cuts 738 may be arranged in a variety of patterns along the projection 724. In one embodiment, the perforations or cuts 738 are arranged in an arcuate pattern to

substantially match the inner extension 78 from the over-cap 70, thereby minimizing interference between the over-cap and container lip.

FIG. 2H illustrates another embodiment of a membrane lid 810 in accordance with the present invention. The membrane lid 810 can be identical to the membrane lid described in FIGS. 2C-2G or other embodiments described throughout the present invention unless otherwise noted. For example, the membrane lid 810 includes a substantially triangular-shaped perimeter 814 with sides 816 wherein at least one of the sides (e.g., "816a") can be represented by a hidden line. At least one corner portion 820 is bisected by an imaginary line 818. A projection 824 extends outwardly from the perimeter 814 of an adjacent corner portion 820 and is substantially symmetrically disposed with respect to the imaginary line 818 bisecting the adjacent corner portion 820. The projection 824 extends non-continuously from the adjacent corner portion 820. A weakened area of the projection 824 includes a scored portion wherein the projection includes one or more crimps 838.

The crimps 838 can be symmetrically or non-symmetrically disposed about the imaginary line 818. In one example, one or more of the crimps intersect the imaginary line 818 to cause an interruption in the projection 824 along the imaginary line 818. In alternative embodiments, each of the crimps 838 may be offset from the imaginary line 818 such that the projection 824 is not interrupted along the imaginary line 818. For example, although not shown, exemplary embodiments include a plurality of crimps 838 offset from the imaginary line 718 without intersecting with the imaginary line 818 such that the projection 824 is not interrupted along the imaginary line 818.

The crimps 838 may be arranged in a variety of patterns along the projection 824. In one embodiment, the crimps 838 are arranged in an arcuate pattern to substantially match the inner extension 78 from the over-cap 70, thereby minimizing interference between the over-cap and container lip.

The above-described embodiments are exemplary in nature and may include other embodiments in accordance with the concepts of the present invention. For example, any combination of the above features, or their equivalents, could be incorporated to provide the non-continuous extension. In addition, while the non-continuous extension of exemplary embodiments described above have related to projections that are substantially symmetrically disposed with respect to the imaginary line of the adjacent corner portion, the projection can also extend non-continuously from the perimeter of other embodiments to further limit or prevent portions of the projection from interfering with the connection between the over-cap and the lip.

For example, the projection can extend non-continuously from the perimeter while also being non-symmetrically disposed with respect to the imaginary line of any adjacent corner portion. In addition, exemplary membrane lids in accordance with the present invention can include a plurality of projections including one or more of the projections described throughout the application or their equivalents (e.g., one or more of the projections illustrated in FIGS. 1, 2A-2E, and 3 for example).

In any of the embodiments described above including a projection with a plurality of tabs, the tabs may be joined together with membrane portions having an outer perimeter with a curved perimeter and/or a perimeter without sharp angles that might otherwise provide potential stress concentration points for membrane tear.

As described above, providing a projection with a plurality of tabs may assist in left or right handed removal of the membrane lid from the container. The additional tabs may also facilitate removal of residual membrane lid portions if the membrane lid rips during the process of removing the membrane lid from the container. For example, a first tab might be gripped to remove the lid. After applying a lifting force, the membrane may inadvertently tear into two portions wherein only a first portion is removed by the consumer. The second tab could then be used to remove the remaining portions of the lid.

It is also desirable to minimize the amount of material used for the membrane lids described above to reduce material expenses and minimize the projection hang-over that might otherwise be unsightly and/or cover portions of the container display surface. The amount of overhang or amount of excess membrane material around the remainder of the lid which will extend past the point of sealing along a container lip is typically proportional to the removal functionality of the membrane lid. The amount of overhang can vary from 0 mm, where the seal is at the very edge of the membrane lid, and in other examples can extend to about 3 mm from the seal between the container and the membrane lid. In another example, the overhang of the membrane lid past the seal is from about 0 mm to about 1 mm, or in another exemplary embodiment from 0 mm to about 0.5 mm. In still another embodiment, the overhang can be wrapped under the lip to which the membrane lid is applied.

A variety of materials may be used to fabricate the membrane lid. The membrane lid can be formed of a single piece of monolayer or multilayer material. Typical multilayer material comprises at least one layer of an oxygen and moisture barrier material, for example foil, and one layer of sealant, for example a thermoplastic polymer which will seal to a container lip. The layer of sealant can be a coating or continuous or non-continuous layer (e.g., coating) to seal with the



appropriate surface. For example, the sealant can be applied as a non-continuous layer to the membrane or on the container lip prior to sealing to minimize the amount of sealant, thereby avoiding excess waste of unused material. In other applications, it can be desired to provide the layer as a continuous layer to one of the remaining layers of the membrane lid in order to simplify formation of the membrane lid from a continuous sheet of material.

In one embodiment, the membrane lid is formed of a multilayer laminate comprising an acrylic primer, a foil layer of about 0.0015 inch thickness, and an ethylene vinyl acetate sealant layer of about 0.00125 inch thickness. An adhesive layer may be provided between the foil layer and the ethylene vinyl acetate layer, if desired. The lid membrane structure presented herein can be used with other membrane materials without departing from inventive concepts of the present invention.

FIG. 3 illustrates a stack of membrane lids 1000 where each membrane lid 1010 can include at least one bevel portion 1011 to assist in stacking and aligning a plurality of membrane lids prior to applying the membrane lid to the container. In one example, a 6.4 mm horizontal distance " $b_1$ " could be provided, with an end bevel offset " $b_2$ " of about 1.5 mm. Accordingly, each of the embodiments described herein may include a membrane lid with at least one bevel portion to facilitate stacking and aligning of a plurality of membrane lids. Moreover, the bevel portion may be provided on the projection or other areas of the membrane lid and can extend about the entire periphery of the membrane lid in additional embodiments.

The membrane lids in accordance with the present invention may be applied to the container, adjacent the container opening, with a variety of attachment techniques. In exemplary embodiments, the membrane lids are structured to be attached to the container with a heat sealing process. In one embodiment, the membrane lid may be applied to a container lid by a sealing element at a temperature of greater than about 300°F, for example, from about 350°F to about 450°F for a time and with a force sufficient to seal the membrane lid to the container lip. In one embodiment, the sealing element applies the membrane lid for about 0.5 seconds to about 1 second and with a pressure of about 80 to about 100 psi. The sealing process and corresponding structure is designed to provide a hermetically sealed container while providing a removable lid having an acceptably low lifting force requirement for a consumer to remove the membrane lid from the container.

FIG. 4 sets forth a container which may be used together with a membrane lid according to the present invention. A suitable container is disclosed in U.S. Provisional Application No. 60/248,340 filed November 13, 2000, to Buisson et al entitled "An Improved Plastic Package for

Snack Pieces,” Attorney Docket 8332P. The container may optionally include a container and/or a container bottom design as disclosed in U.S. Provisional Application No. 60/248,103, filed November 13, 2000, and U.S. Application No. \_\_\_\_\_ filed on even date to Buisson et al, entitled “Container Bottom And Methods,” Attorney Docket 8331M.

5 As shown in FIGS. 4 and 5, the container 50 comprises a substantially triangular-shaped container body 52 and an outwardly extending lip 54 adjacent an upper end of the body 52. FIG. 5 shows a top view of the container 50 which demonstrates that both the lip 54 and the container body 52 have a substantially triangular-shaped horizontal cross-section.

10 It is desirable to structure a container with an opening adapted to receive a membrane lid, such as one of the membrane lids described above, to provide a hermetic seal while also presenting a removable closure that can easily be removed by a consumer at will. A stronger seal typically requires increased pressure, heat and/or adhesive between the membrane and container opening to provide a seal strength sufficient to provide the desired hermetic condition. However, increasing the seal strength results in increased effort by the consumer to remove the membrane  
15 lid. Moreover, undue seal strength may also result in ripping or tearing of the membrane as the consumer applies the required lifting force to break the seal and remove the membrane from the container. Therefore, it is desirable to provide a seal sufficient to achieve a hermetic condition while further presenting a user-friendly membrane lid that may be easily removed when desired.

20 As described above, the seal strength is often a function of pressure, temperature and/or adhesive between the membrane lid and the container during the sealing process. The inherent properties of a non-circular container lip shape may cause uneven vertical rigidity. Uneven rigidity typically causes varying reaction pressures at various locations around the lip. To ensure a sufficient hermetic seal at all locations of the lip, the membrane lid application force must be increased to provide the minimum required reaction pressure at all locations around the lip.

25 Accordingly, areas having the lowest rigidity will have the required minimum reaction pressure necessary to achieve the hermetic seal, however, the points along the lip having a higher reaction pressure will provide an excessive seal strength that may prove difficult for a consumer to overcome.

30 To provide a seal that is within the desired strength range, it is beneficial to provide a seal having a substantially constant strength about the container opening to thereby avoid sealing areas having excessive sealing strength. Accordingly, a substantially uniform reaction pressure may be desired at each point of the seal along the lip when pressing the membrane lid against the container during the sealing process. Providing a substantially uniform reaction pressure will

permit application of sealing force sufficient to meet the minimum requirements of a hermetic seal without having unnecessarily strong sealing areas that are more difficult to overcome.

The structure of circular containers having a circular horizontal cross-section generally provide a uniform lip having a uniform reaction pressure when sealing a membrane lid to the container. Accordingly, applying a sealing force to a membrane lid against a conventional circular container will typically result in a constant reaction pressure at all contact locations between the container lip and the membrane lid. However, container lips having a substantially triangular-shaped horizontal cross section may not have an inherently uniform reaction pressure when forcing the membrane lid against the container lip. Rather, attempting to seal a membrane lid to the substantially triangular-shaped container lip by applying a sealing force to the membrane lid may result in an uneven reaction pressure at different points of the container lip and therefore varying degrees of sealing strength between the container lip and the membrane lid. Typically, the lip of a substantially triangular-shaped container inherently has a greater degree of vertical rigidity at the corner portions than at the sides between the corner portions, thereby resulting in a higher degree of flexing of the sides than the corner portions upon application of a sealing force to the membrane lid. Accordingly, by the inherent nature of a substantially triangular-shaped lip, the reaction force and corresponding reaction pressure will typically be greater at the corner portions resulting in a higher seal strength at the corner portions than at the sides between the corner portions. To ensure a sufficient hermetic seal strength at the sides, an increased application force must be administered to the membrane lid that will also cause excessive reaction pressure and a correspondingly excessive seal strength at the corner portions. The increased seal strength at the corner portions may be difficult to overcome by a consumer attempting to remove the membrane lid or may also result in membrane lid tears.

In accordance with inventive concepts of the present invention, the lip of the substantially triangular-shaped container has sides that are structured differently than the corner portions to increase the relative rigidity of the sides with respect to the corner portions. In fact, the different structure reduces or substantially prevents differences in vertical rigidity between the corner portions and sides and can result in a substantially constant reaction pressure in response to a sealing force. Accordingly, with the inventive concepts of the present invention, a membrane lid may be sealed to a substantially triangular-shaped lip with a substantially constant strength seal about the opening of the container.

For example, FIGS. 5, 5A, 6 and 7 depict exemplary embodiments of a container 50 including a lip 54 adjacent an opening of a container body 52 wherein the lip 54 has sides 58

structured differently than the corner portions 56 to increase the relative rigidity of the sides 58 with respect to the corner portions 56. Indeed, the different structure of the sides 58 and corner portions 56 provides a lip that exhibits a substantially uniform reaction pressure when applying a membrane lid to the lip 54 of the container 50.

FIG. 6 depicts an enlarged side view of an exemplary corner portion 56 of the lip 54 from Detail 6 in FIG. 4, while FIG. 7 illustrates an enlarged side view of the side 58 of the lip 54 from Detail 7 in FIG. 4. Moreover, FIG. 5A depicts a cross-sectional view of the corner portion 56 and side 58 of the lip 54. The lip 54 has a top surface 60, an outer wall surface 62, 63 and a bottom surface 64. In addition, the outer wall surface 62 of the corner portion 56 has an outwardly protruding substantially U-shaped configuration with a rounded apex 68. This configuration provides the corner portions 56 with sufficient structural integrity to receive the membrane lid. In contrast, the sides 58 of the lip 54 are structured differently with a substantially flat outer wall surface 63 when compared to the U-shape of the outer wall surface 62 of the lip corner portions 56. With this configuration, the desired corner portion and side rigidity can be obtained while maintaining a uniform vertical height  $H_1$  from the top surface 60 to the bottom surface 64 of the lip 54. As illustrated in FIG. 7, while the substantially flat outer wall 63 can have a minor degree of curvature, the outer wall 63 is substantially flat when compared to the U-shaped profile of the outer wall surface 62 at the corner portions 56. Modifying the outer wall 63 such that it is substantially flat, rather than having a U-shaped profile, increases the relative rigidity to the sides 58 with respect to the corner portions 56. Accordingly, the combination of the U-shaped outer wall surface 62 of the corner portions 56 and the substantially flat outer wall surface 63 of the sides 58 provides a substantially triangular-shaped container lip 54 which exhibits a substantially uniform reaction pressure when applying a membrane lid to the lip of the container when compared to the reaction pressure exhibited when applying a membrane lid to a substantially triangular-shaped container lip with a substantially uniform lip structure at the corners and sides.

While a wide range of protrusion distances may achieve the desired lip structure, FIG. 6 depicts one embodiment where the distance  $L_1$  which the lip protrudes beyond the container body, may be from about 0.03 to about 0.10 inch. In one particular example,  $L_1$  is about 0.08 inch. With reference to FIG. 7, the distance  $L_2$  which the lip protrudes beyond the container body, may be from about 0.01 to about 0.10 inch. In one particular example,  $L_2$  is about 0.06 inch.

The container may be formed with a variety of lip structures to provide the lip with a substantially uniform reaction pressure when applying the membrane lid to the container opening. FIGS. 5B and 7A depict an alternative embodiment of a container lip 154 in accordance with

additional exemplary embodiments of the present invention. As illustrated in FIG. 5B, the corner portion 156 is structured similar to the corner portion 56 of FIGS. 5A and 6 and can be identical. The container lip 154 includes a top surface 160, a bottom surface 164, and an outer wall surface 162 with an outwardly protruding substantially U-shaped configuration with a rounded apex 168.

5 With reference to FIGS. 5B and 7A, the container lip 154 further includes sides 158 structured differently than the corner portions 156 of the lip 154 to increase the relative rigidity of the sides 158 with respect to the corner portions 156. The exemplary sides 158 are structured with an outwardly protruding substantially W-shaped outer wall surface 163 wherein apex areas 167 of the W-shaped surface 163 extend outwardly from the container body and are disposed on opposite  
10 sides of a recessed central portion 169. The W-shaped sides 158 have a horizontal thickness  $T_1$  at the apex areas 167 and has a greater horizontal thickness than the horizontal thickness  $T_3$  of the recessed central portion 169 or the horizontal thickness  $T_2$  of the corner portion 156. Such extra horizontal lip thickness at the apex areas 167 may be obtained by creating the W-shaped sides using a blow-molding process. Providing the container lip 154, as illustrated in FIGS. 5B and 7A,  
15 with W-shaped sides 158 having increased horizontal thickness  $T_1$  at the apex areas 167 increases the relative rigidity of the sides 158 with respect to the corner portions such that the corner portions 156 and sides 158 are adapted to exhibit a substantially uniform reaction pressure when applying a membrane lid to the lip of the container when compared to the reaction pressure exhibited when applying a membrane lid to a substantially triangular-shaped container lip with a substantially uniform lip structure at the corners and sides. Moreover, as with the embodiment of  
20 FIG. 7, the structural properties of the lip 154 may be achieved with the corner portions and the sides having a wall surface with the same vertical height between the top surface 160 to the bottom surface 164.

FIGS. 5C and 7B illustrate additional embodiments of a container lip 254 includes having  
25 corner portions 256 with an outer wall surface 262 having a substantially U-shaped configuration with a rounded apex 268 and sides 258 with an outer wall surface 263 with rounded apex 267 that is similar or identical to the outer wall surface 262. As further illustrated in FIG. 5C, the horizontal lip thickness  $T_1$  of the sides 258 is larger than the horizontal thickness  $T_2$  of the corner portions 256 to increase the relative rigidity of the sides 258 with respect to the corner portions  
30 256 such that the corner portions 256 and sides 258 are adapted to exhibit a substantially uniform reaction pressure when applying a membrane lid to the lip of the container when compared to the reaction pressure exhibited when applying a membrane lid to a substantially triangular-shaped container lip with a substantially uniform lip structure at the corners and sides. Moreover, as with

the embodiment of FIGS. 7 and 7A, the structural properties of the lip 254 may be achieved with the corner portions and the sides having a wall surface with the same vertical height between the top surface 260 to the bottom surface 264.

The above embodiments are exemplary in nature. Additional structural differences between the sides and corner portions are intended to be encompassed by the present invention as long as the sides are adapted to exhibit a substantially uniform reaction pressure when applying a membrane lid to the lip of the container. Moreover, the term “substantially uniform reaction pressure” is intended to include reaction pressures that are uniform at the corner portions and sides as well as “substantially uniform” when compared to the differences in reaction pressure between the corner portions and sides when applying a membrane lid to a substantially triangular-shaped container lip with a substantially uniform lip structure at the corners and sides. Accordingly, a “substantially uniform pressure” may include pressures that are different but more uniform than would otherwise be exhibited by corner portions and sides having substantially the same lip structure.

In addition, a combination of the embodiments described above can be applied to arrive at the desired rigidity for the sides and corner portions. For example, the horizontal thickness of the lip could vary (e.g., as illustrated in FIG. 5C) as well as the profile of the outer wall surface (e.g., as illustrated in FIGS. 5A and 5B).

In exemplary embodiments of the lip structure, the top surface of the lip can extend horizontally from the top of the outer wall surface or at an upward angle with respect to the horizontal. Thus, angle “c” (e.g., see FIGS. 6, 7, 7A and 7B) can be from about 0° to about 20°, for example from about 5° to about 18°, and in one example from about 8° to about 12°. By arranging the top surface horizontally or at an angle greater than 0°, the container lip exhibits a spring-like motion when a membrane lid is applied thereto and therefore provides resistance to the membrane sealing force to result in a better membrane lid seal. The upward angle of the top surface also assists in providing a substantially uniform reaction pressure along the lip upon application of the membrane and alleviates the impact of imperfections in the lip resulting from trimming, mold parting lines and the like. While the top surface is illustrated as being directed upwardly and inwardly, the top surface could alternatively be oriented to extend upwardly and outwardly.

In one embodiment, a uniformly angled top surface is obtained by using a mold with a greater top surface angle “c” at the sides than the top surface angle “c” at the corner portions of the lip. For example, a mold may be provided with a top surface corner portion angle “c” of about

15° with respect to the horizontal and a top surface side angle “c” of about 20° with respect to the horizontal.

While the membrane lid and lip structure described above are useful individually, they may be used in combination. For example, a combination of any of the membrane lids with any of the lip structures described herein can be used to provide a substantially uniform reaction pressure along the perimeter of the lip upon application of the membrane lid to obtain and maintain a hermetic seal while providing a membrane lid that can be easily removed by a consumer at will. As described above the hermetic seal provided by the membrane lid will create an effective barrier against oxygen and moisture

The containers 50 in accordance with the present invention may be formed by a variety of methods. For example, the container 50 may be formed from a thermoplastic material and can be blow molded, although other production methods may be employed. Suitable thermoplastic materials include, but are not limited to, polyolefins, such as polyethylene and polypropylene, vinyl polymers such as ethyl vinyl alcohol (EVOH), or the like. These materials may be monolayered and some of the materials may be combined. For example, a multilayer material may include both a polyolefin layer and an EVOH layer. In a specific embodiment, the container 50 is blow molded from a multilayer material comprising a layer of EVOH sandwiched between two layers of high density polyethylene (HDPE).

One particular embodiment of the blow-molded, multiple-layer plastic structure of the container is as follows: a virgin polyolefin layer, a tie layer, a layer of EVOH, another tie layer, and another virgin polyolefin layer. Typically, container 50 will also have one or more layers of regrind material in-between the tie layer and the virgin polyolefin layer. The layer of EVOH might be no less than 0.00005 inches thick and no thicker than 0.006 inches, for example no less than 0.00005 inches and no greater than 0.003 inches and in another example no less than 0.0001 inches and no greater than 0.0012 inches.

An even more particular example of this multilayer plastic structure comprises a six-layer structure including the following layers (from the outside layer to the inside layer): about 9.31 grams (g) or about 19.4% by weight of HDPE; about 18.91 g or about 39.4% by weight of Plant Regrind and HDPE; about 0.62 g or about 1.3% by weight of a tie layer; about 2.02 g or about 4.2% by weight of EVOH; about 0.62 g or about 1.3% of a tie layer; and about 16.51 g or about 34.4% of Plant Regrind and HDPE.

Another example of this six-layer structure can comprise (from outside layer to inside layer): about 10.7 grams (g) or about 19.4% by weight of HDPE; about 21.66 g or about 39.4% by

weight of Plant Regrind and HDPE; about 0.69 g or about 1.3% by weight of a tie layer; about 2.33 g or about 4.2% by weight of EVOH; about 0.69 g or about 1.3% of a tie layer; and about 18.94 g or about 34.4% of Plant Regrind and HDPE.


Yet another example of this six-layer structure can comprise (from the outside layer to the inside layer): about 15.0% by weight of HDPE homopolymer and color; about 63.6% by weight of Plant Regrind (60% by weight) and HDPE homopolymer and color (40% by weight); about 1.4% by weight of a tie layer; about 3.6% by weight of EVOH; about 1.4% of a tie layer; and about 15.0% of Plant Regrind and HDPE homopolymer and color.

The container will typically have a thickness of from about 0.005 to about 0.055 inches, for example from about 0.010 to about 0.045 inches. The container body 52 and the lip 54 are integrally formed, for example, by a blow molding process. Advantageously, the lip structure described herein is self-supportive on the underside of the top surface of the lip. Thus, the lip structure may be formed by blow molding while overcoming the disadvantages of many conventional lip designs which require mechanical support for application of the membrane.

In another embodiment of the containers according to the invention, the containers can further include an over-cap 70, an example of which is set forth in FIGS. 8 and 9. For example, the over-cap 70 could comprise one of the over-caps described in U.S. Provisional Application No. 60/248,089, filed on November 13, 2000, entitled "Substantially Triangular-Shaped Over-Cap," and U.S. Application No. \_\_\_\_\_ filed on even date, entitled "Substantially Triangular-Shaped Over-Cap," to Buisson et al., Attorney Docket 8329M, which are incorporated herein by reference.

The exemplary over-cap 70 of FIGS. 8 and 9 comprises a substantially triangular-shaped top surface 72 and a skirt 74 extending substantially downwardly from the perimeter 76 of the top surface 72. As is further shown in FIGS. 8 and 9, the skirt 74 includes substantially rounded corner portions and substantially straight sides extending around the perimeter 76 of the top surface 72. The skirt corner portions include inner extensions 78 while the skirt sides are substantially free of inner extensions. As used herein, "substantially free of inner extensions" includes instances wherein the skirt sides have a sufficiently small percentage of such inner extensions such that the corner portion inner extensions are not prevented from moving inward when an outward pressure is exerted on the underside of the over-cap. In one embodiment, the skirt sides are free of inner extensions. The skirt including corner portions having inner extensions and skirt sides substantially free of inner extensions provides the over-cap with the ability to securely attach to the lip 54 of the container 50 described herein and resist pressure





differentials between inner and outer sides of such a container. Advantageously, this structure also allows easy removal of the over-cap from such a container when desired by a consumer.

The specific embodiments and examples set forth above are provided for illustrative purposes only and are not intended to limit the scope of the following claims. Additional  
5      embodiments of the invention and advantages provided thereby will be apparent to one of ordinary skill in the art and are within the scope of the claims.